I General

The objective of the competition is to provide Indiana high school students with a challenging and educational activity combining the theoretical aspects of mathematics, science and technology with practical experience in design, fabrication, and testing of an actual vehicle.

In an effort to increase public awareness in the area of fuel economy, a fuel economy challenge will be held. Participating students will be challenged to build a one man, fuel-efficient vehicle powered by a single cylinder four-stroke cycle engine. The vehicles will run a specified course with the vehicle obtaining the highest miles-per-gallon rating winning the challenge. Other awards will be given for best integration of Mathematics, Science and Technology into the design and construction of the vehicle, best design, craftsmanship, sportsmanship, teamwork, closest to estimated performance and best communication and marketing program.

This challenge is designed as an inter-disciplinary unit for Mathematics, Science and Technology. The lessons involved in the design and construction of this vehicle are unlimited for creative students and teachers.

Design and construction of the vehicle is intended to be a student project performed by the students under the guidance and supervision of adult faculty members and/or parents. Parts and components fabricated by non-students should be kept to the minimum. Where outside facilities must be used, the instructors should ask those facilities to allow maximum student participation or, at the least, request that they provide explanations of the operations involved and allow students to observe the process.

II Organization

The Super Mileage Challenge is sanctioned by the Indiana Department of Education and the Indiana Mathematics, Science and Technology Education Alliance (IMSTEA) and is conducted under the supervision of the IMSTEA Competition Committee. The Competition Committee shall have complete authority over all phases of the event including the establishment and publication of rules governing the event. The Competition Committee shall consist of the President of IMSTEA and those persons appointed by the President from time to time. Membership in IMSTEA is not required to serve on the Competition Committee. In any dispute, protest or inquiry, the decision of the Competition Committee will be final.

III Classes of Competition

Two classes of competition are provided, Stock and Unlimited.

In the Stock class, engines are provided to the participants and must be maintained in strictly stock condition. No modifications are allowed. The engines will be sealed prior to delivery to each team, and any evidence of tampering with the seals may result in disqualification.

Engine modifications are allowed in the Unlimited class. The allowed modifications are spelled out in another section of these rules.

Only one entry is allowed in each class for any school. A school may not enter the Unlimited class unless they have previously participated in one event in the Stock Class.

IV Proposal

In order to be approved for participation, each school must submit a separate, detailed proposal for each class entered. Proposals must be postmarked no later than the deadline date established by the Competition Committee. Upon approval of the proposal by the IMSTEA Competition Committee, the team will be issued a number and allowed to participate in the Super Mileage Challenge. A non-refundable entry fee in the amount established by the Competition Committee must accompany each proposal. Teams will be allowed an opportunity to correct problems with their proposals after initial review, but must be able to do so before the revision deadline date established by the Competition Committee.

The proposal must be printed or typewritten in a minimum of 12 point type on plain, white, 8.5 inch by 11 inch paper and bound in a flexible binder or three ring binder. Computer generated text and drawings are permitted, but no large or outsize drawings should be included unless absolutely necessary to explain some unusual aspect of the proposed design.

The design proposal serves two purposes. First, it is an information document allowing the Competition Committee to determine that the vehicle design conforms to the rules. Second, it ensures that the entry is a result of a genuine design effort integrating math, science, engineering and technology.

Please Note: The proposal may be for a design concept and does not have to reflect the vehicle as actually built. At the time of technical inspection, the team must present to the inspector, in writing, descriptions of those areas where the finished vehicle differs from the conceptual design of the proposal.

A proposal will consist of the following sections:

Title Page

The first page of the proposal must contain the following information:

School name and address.
Class the proposal covers (Stock or Unlimited)
Full name of the lead faculty advisor.
Phone number of the lead faculty advisor.
Email address of the lead faculty advisor.
FAX number of the lead faculty advisor.
Full name of the Science faculty advisor.
Phone number of the Science faculty advisor.
Full name of the Mathematics faculty advisor.
Phone number of the Mathematics faculty advisor.
Full name of the Technology faculty advisor.
Phone number of the Technology faculty advisor.
Full name of any advisor from the community, if applicable
Phone number of the community advisor

Date the proposal is prepared.
(**Note**: The lead faculty advisor may also serve as one of the other required advisors.)

Section I – Design Concept

This section gives an overall description of the design and outlines any unique or unusual aspects of the proposed design.

This section must include a dimensioned drawing of the proposed design showing the outside configuration including the positioning of numbers and location of windows if a closed body is used. This is comparable to photos of the finished vehicle from the side, front, top and rear.

If a vehicle from a previous year is being used, this section must include a description of the changes made from the previous year. This may be a general discussion with details described in later sections dealing with those systems.

This section must include a description of the team organization and whether the project is part of the normal school curriculum or being conducted as an extra-curricular activity.

Section II – Frame/Chassis

This section must describe how the frame/chassis of the vehicle is to be built. It must describe the materials and the methods to be used in fabricating the frame/chassis. This section must also detail any participation by any person or firm outside the school.

This section must include a three view, dimensioned drawing of the frame/chassis without the body or other components attached. If the vehicle does not have a separate body, the placement of the numbers must be shown on this drawing.

Section III – Body

This section will describe the materials and methods to be used in fabricating the vehicle's body. If the vehicle will not use a body, this section should state that fact.

This section must also detail any participation by any person or firm outside the school in the design or construction of the body.

A three view, dimensioned drawing of the body must be included, and this drawing must show the location of all transparent portions of the body. This drawing will also show where the numbers will be placed. If there will be no body, the method of number placement must be shown on the drawing of the frame/chassis.

This section must describe how the body will be attached to the chassis/frame, and how the driver will gain access to the vehicle if the body is closed.

Section IV – Drive Train

This section must include a thorough discussion of the method of driving the vehicle from the engine.

A three view, drawing of the drive train must be included.

For Unlimited proposals, this section must also describe, in detail, all modifications proposed for the engine. If none are planned, the proposal must state this fact.

Section V – Braking System

This section must include a discussion of the proposed braking system for the vehicle and calculation of the estimated braking distance for the proposed design.

A three view, drawing of the braking system must be included showing the braking system for each wheel where brakes are installed and the method for driver actuation of the brakes.

Section VI – Fuel System

This section must show a drawing of the fuel system to be used in the vehicle including the location and means of mounting the fuel tank, the length of the fuel line in inches and any provisions for fuel cooling or heating.

For unlimited entries, this section must list the carburetor to be used by model number and manufacturer or state that the stock unit will be used. Carburetors with oversized float chambers are not allowed. Fuel pumps are permitted, but no device that may act as an accumulator is allowed.

This section must also show how the driver is prevented from reaching the fuel tank while in the vehicle.

If fuel injection is used in unlimited entries, this system must be diagramed and manufacturer and model number of components must be included. Any flexible hose used on the high pressure side of the fuel pump must be aircraft type high pressure fuel hose with aircraft style fittings.

Section VII – Steering System

This section must discuss the means to be used to steer the vehicle and include diagrams and/or calculations showing that the design will meet the turning radius requirement of these rules.

Please note that a steering wheel system must be used. Tillers, steering bars or other systems are not permitted. A drawing of the proposed steering system must be included.

Section VIII – Safety

This section must include a three-view drawing showing the location of all required safety equipment. Any additional or unusual approaches to safety must also be discussed. The material and thickness of the firewall must be listed in this section.

This section must show how the driver will be seated in the vehicle and show that such seating conforms to all rules listed herein.

If a closed body is used, this section must also discuss the means of driver emergency exit from the vehicle, means of providing for ventilation for the driver's compartment and means for routing engine exhaust gases outside the body.

This section must show how the minimum driver weight will be achieved. If weight belts will be used, this should be stated. If ballast weights will be added to the vehicle, this section should include a reference to a drawing showing that the system for adding these weights conforms to the rules

Firewall material and thickness must be specified in this section.

Section IX – Aerodynamics

This section must include a discussion of the aerodynamic qualities of the vehicle. It must include a calculation of the vehicle's aerodynamic drag showing the value of all factors involved and the equation used for the calculation. The impact of headwinds, tailwinds and crosswinds must be evaluated.

Section X – Cornering Forces

This section must include a discussion of the impact of cornering forces on the vehicle. Calculations must be shown for anticipated cornering forces

Section XI – Braking Distance

This section must include calculations showing the anticipated braking distance for the vehicle. The calculated distance must be less than the figure allowed in these rules.

Section XII – Rolling Friction

This section must include a discussion of the factors contributing to rolling friction and describe any testing procedures planned to determine rolling friction. Means of reducing rolling friction must also be discussed.

Section XIII – Performance

This section must include a discussion of driving techniques to be used in the competition. Best speeds, engine parameters and any instrumentation to be used will be included in this section. **An estimate of the vehicle's performance in miles per gallon must be included.**

Section XIV – Accessories and Instrumentation

This section must describe all accessories and instrumentation to be installed in the vehicle besides the components previously mentioned. The purpose and operation of each unit must be described in detail.

For unlimited vehicles, this section must include a complete drawing and description of the electrical start system, if used. It must also describe how the system will be disconnected from the drive system so that it may not be used to power the vehicle.

Section XV - Cost Estimate

This section will include a detailed cost estimate for the design and construction of the vehicle. All parts, purchased or manufactured, must be shown. Any services obtained must be listed at quoted cost. Items donated must be listed, but no cost figure is required. Donated items must be identified as such. This is an estimate. Exact figures for every nut and bolt are not required, but it should reflect at least 85% of the vehicle's final cost.

V Rules Governing the Vehicle

A. General Configuration:

1. The vehicle must have a minimum of three wheels touching the ground at all times. Tandem, two wheel configurations with outrigger wheels are prohibited. Also prohibited are configurations where any part of the driver extends beyond the frame of the vehicle; i.e. bicycle or luge style designs.

2. Overall vehicle length, width, and height will not be regulated. However, the distance between the centerline of wheels on any axle (track) may not be less than twenty inches (50 cm), and the distance between the front and rear axle centerlines (wheelbase) must be at least 1.5 times the front track.

3. The driver's head must be behind his/her feet in the normal driving position.

4. Design shall be such that the driver may not come into contact with a wheel or any other moving part while in the normal driving position. If the wheels are inside the body shell, they must be shielded to prevent manual propulsion by the driver.

5. The fuel tank must be located in such a position that it will be impossible for the driver to shut off the fuel valve while operating the vehicle or to make any adjustment to the height of the tank. Electrical fuel shut off valves are not permitted. The copper screen in the fuel valve provided with each tank must be in place and intact. Removal or damage to the screen may result in disqualification.

6. Each vehicle will be assigned a number. This number must be displayed on both sides of the vehicle. The numbers must be painted a contrasting color to their background. Black numerals on a white background are preferred. Unlimited class entries will be followed by a capital letter "U". The numerals must be at least 10 inches tall, and the capital "U" for the unlimited class will be six (6) inches tall.

7. Vehicles used in previous events may be used in subsequent events providing modifications acceptable to IMSTEA are made from year to year. Repainting the vehicle is not considered to be a significant modification.

B. Maneuverability: Each vehicle must have a steering geometry capable of a 25 foot maximum inside turning radius for either right hand or left hand turns measured at the most outside wheel in the turn. Vehicles must use steering wheels. No tillers, steering bars, steering cables or foot actuated steering devices will be allowed. Steering wheels must have a minimum outside diameter of eight (8) inches and function in a conventional manner. "Bow Tie" units are permitted.

C. Stability:

1. Each vehicle will be required to demonstrate its longitudinal stability. The vehicle, with the qualified driver in driving position, must maintain full wheel contract on an inclined plane (ramp) of 15 degrees (measured from horizontal) when located statically on the inclined plane in the following configuration.

2. Two ramps will be used, one for the front wheel(s) and one for the back wheel(s). The vehicle will be placed so that all wheels are in contact with the ramp surfaces. If the track of any axle is too wide for the ramps, one wheel may be placed on the horizontal floor surface as close to the edge of the ramp as possible. No supporting structure or wheel may contact the inclined plane or horizontal floor surface.

3, The vehicle must not tip or lose balance when the steering wheel/wheels are to turned lock to lock. This test will be performed with no help to stabilize from the pit crew.

D. Engine:

1. Stock Class.

a. All vehicles are required to use air cooled, four-stroke cycle Briggs and Stratton model number 93412 engines.

b. The engine must be box stock! This means no electric start, the governor must remains on the engine (attached and working), no air filter removal (including the canister) or changes, and no changes in exhaust (the stock muffler must remain in place). However, an extension after the muffler to exhaust fumes out of the vehicle and away from the driver is permitted. An alternate muffler may be installed using "Max Power" part number 4132 or Briggs & Stratton part number 89966 in place of the stock muffler. If an alternate muffler is used, it must be positioned at the exhaust port of the engine. Repositioning of the recoil starter housing and lengthening of the recoil starter rope to suit engine and driver position to provide for re-starts by the driver are also allowed. No other changes, additions, subtractions or improvements are allowed. Alternative spark plugs may be used, and any type of oil may be used in the engine.

c. The 93412 engine will be modified prior to delivery and sealed. Any entrant on which the engine seals have been broken or tampered with in any manner will be considered for disqualification.

d. Briggs & Stratton high altitude jets may be used in stock class carburetors. These jets are part number 494870 (after code date 96032400) and 497466 (before code date 96032500).

2. Unlimited Class

a. The unlimited class may utilize either the model 90102 (black) engine or the model 93412 (red or silver) engine.

b. The unlimited class engine must retain the cylinder block, crankshaft and crankcase of the stock engine. The crankshaft must also occupy its original position in the crankcase, and the deck height of the cylinder block (the distance between the center line of the crankshaft and the mating surface of the cylinder head with the block) must remain the same as the stock engine. Any other parts may be removed, modified, replaced or homologated as desired.

c. Electric start is permitted in the unlimited class, however there must be no provision for driving the vehicle with the starter motor. Batteries to be used for electric start will be limited to the capacity needed to start the engine.

d. Carburetors with oversize float chambers will not be allowed.

e. No device which acts as an accumulator may be added to the fuel system.

f. If fuel injection is used, a one-way check valve allowing flow only from the fuel pump to the injector must be installed. This valve must be mounted as close as possible to the fuel pump. Fuel return from the injector to the fuel tank is allowed only while the engine is running. All high pressure lines must be aircraft high pressure fuel lines with metal, aircraft style fittings.

E. Additional On-Board Equipment: Batteries may be carried in each vehicle to power auxiliary systems i.e. tachometers, recording devices, indicators or communication equipment (starters on unlimited class). They must in no way be capable of powering the vehicle. The sole source of vehicle propulsion must be from the engine. This means no human power system, sails, etc. Any inertial system, if used, must be at rest prior to the start of any performance runs. Any vehicle found in violation of this rule may be eliminated from competition and any completed runs may be forfeited.

F. Fuel: The fuel used will be furnished by the competition committee to provide uniformity in the composition. Fuel tanks must be obtained from the IMSTEA competition committee and may not be modified except to provide for adequate tank venting.

G. Drivers:

1. Only two drivers are permitted for each vehicle. Teams will furnish driver names on their team rosters, and only those designated drivers may operate the vehicle. If a driver substitution is necessary before technical inspection, the Faculty Advisor will advise the Competition Committee of that change during registration. Should a driver substitution be needed during the event, the Faculty advisor will obtain permission for that substitution from the Competition Committee.

2. Minimum driver weight is 150 pounds(68Kg.) Fully equipped, including helmet.

3. Drivers who do not meet the minimum weight requirement must provide ballast to bring their weight up to the 150 pound base limit.

a. Ballast may be attached to the driver or to the vehicle and may not be removed during actual competition (see later design provisions).

b. When the weight is attached to the driver it must be in the form of a diver's belt.

c. Weights must be either circular barbell weights or lead bars. For barbell weights, a vertical post of sufficient diameter to match the inner bore of the weights and of sufficient strength to withstand crash force stress will be attached to the vehicle by welding or other suitable method acceptable to the Competition Committee. The weight shall be held in place with a pin or other suitable fastener. If lead bars are used, the bars must be bolted to the frame of the vehicle using two bolts of at least 5/16 inch diameter. One bolt must be placed at each end of the bar. Bolts must be of sufficient length to allow for a thread engagement of at least .5 inches. The method of weight attachment must be clearly shown on all proposals.

H. REQUIRED SAFETY ITEMS: The following are the minimum safety items required for all vehicles. Failure to comply with these specifications will result in disqualification until such infractions are corrected.

1**. Kill Switch:** Two kill switches grounding the engine ignition are required. One must be mounted in easy reach of the driver, and one must be accessible from outside the vehicle (for pit crew).

a. The exterior kill switch must be marked with a bright, yellow color, square marking no less than 2" square.

b. All kill switches must be a toggle type with a minimum of a 3/4" metal paddle.

c. The exterior kill switch must be mounted on the upper half of the body.

2**. Guards and Shields:**

a. All moving power train components must be guarded from accidental breakage or body contact by drivers, pit crew members, officials and observers`.

b. If the wheels are inside of the body shell, then they must be shielded to prevent propulsion by the driver.

c. The driver must be shielded from the ground.

d. All wires, lines, tubes etc. must be secured to the vehicle.

3**. Helmets:** The driver must wear a motorcycle type (DOT approved) or Snell rated helmet. If the driver is not inside a closed body, and a full face helmet is employed the visor must be down while driving. If the helmet is not full face or does not have a visor, the driver must wear goggles. A hard shell bicycle type helmet will NOT be allowed.

4. Clothing: Drivers must wear shoes that cover the entire foot. Sandals or open toe or heel shoes will not be permitted. Drivers must wear trousers covering the entire leg. Shorts are not permitted. Exposed skin should be kept to the minimum.

I**. Fuel and Lubrication Systems:**

1. Fuel and lubrication systems should be designed so that any loss of fluids will not result in a fire hazard.

2. Pressurized tanks will not be allowed for any system.

3. All push-on fuel line fittings must be clamped or wired.

4. Care should be taken to provide a readily accessible mounting location for the fuel tank. However, the fuel tank must not be accessible from the driver's position for any purpose.

5. All fuel tanks must be mounted in the position that they were designed. No tilting of tanks in any way will be allowed.

6. The fuel line must be 1/4 inch ID clear plastic, one piece and no longer than 24 inches.

7. No filter, valve, diverter or any other type of device may be mounted between the fuel tank and the carburetor. Where fuel injection is used, the fuel line must connect to a one way check valve installed immediately preceding the fuel pump. The check valve must allow fuel flow only from the tank to the pump.

J**. Brake System:** The brake system must be adequate for safely stopping the vehicle in a reasonably straight line from 15 mph in less than 36 feet (11 meters) in wet or dry conditions.

K**. Fire Extinguisher:**

1. A multipurpose (min. 2lb.) ABC dry chemical fire extinguisher, rating No. 1A10BC, or an equivalent CO_2 device (min. 10lb), must be provided.

2. Systems employing fixed extinguishers directed at the engine compartment and employing remote actuation must be manually actuated. No electric actuation systems will be allowed. If a tubing delivery system is used, 1/2 in. inside diameter tubing of no more than 46" length may be used. Tubing extending past the firewall and into the engine area must be metal.

Flexible tubing may be used between the fire extinguisher and the firewall, but the routing must be such that it is in no danger of being pinched shut by the driver or any other equipment.

L. Exhaust System: Engine exhaust must exit the vehicle body (exhaust cannot be enclosed).

M. Ventilation:

1. The drivers compartment must be provided with flow-through ventilation for driver comfort.

` 2. The engine must be provided ample ventilation.

3. The vehicle must be designed so fumes and/or liquids will not be confined.

4. Since the event is run rain or shine, teams should consider means of removing rain from the windscreen and for preventing windscreen fogging.

N. Firewall:

1. A firewall of steel or aluminum material of 0.032 in. minimum thickness must separate the driver from the engine. The firewall may not be removable.

2. The firewall cannot interfere with the operation and use of the fire extinguisher.

3. Any required holes in the firewall must be no larger than necessary to pass wires, cables or other tubes and they must be sealed to prevent the passage of fumes.

O. Driver Exit Capability: The driver must be able to quickly exit the vehicle, unassisted, in case of an emergency. in less than 15 seconds.

P. Rear View Mirrors: All vehicles must be equipped with at least two (2) rear view mirrors. These mirrors must be adjustable and give the driver a clear view to the rear while driving. Mirrors must be securely attached to the body or frame of the vehicle and mounting of these mirrors must be such that they will not change the field of vision when the vehicle is subjected to vibration and shock while running on the racecourse. Each mirror must be at least seven (7) square inches in reflective area. Area will be calculated by multiplying the overall length of the reflective surface by its overall height for rectangular mirrors; $\Pi D^2/4$ for circular mirrors, where D is the overall diameter of the reflective surface; and $\Pi/4$ multiplied by the overall width and height of the reflective surface for oval mirrors.

Q. Safety Wire: All threaded fasteners that are involved with the steering, suspension, drive train, brakes, vehicle main structure or any part that could cause a potential safety hazard must be safety wired or cotter keyed.

R. Alternative Fasteners: If safety wiring or cotter pinning required by "Q". above is not feasible FAA or SAE approved elastic stop nuts may be used. Elastic stop nuts may not be

used in any area where the temperature of the nut will exceed 250° F. Faculty Advisors will take the necessary steps to insure that elastic stop nuts are not re-used after being removed. The Technical Inspection staff may test elastic stop nuts for proper holding friction. Location of elastic stop nuts must be shown on proposal drawings.

S. Waiver Requests: Teams may request that any part of these rules be waived. Waivers will only be granted under unusual circumstances, and in no case will any safety rule be waived. Waivers will be granted at the sole discretion of the Competition Committee. All requests must be submitted on the official request format found in this document and must be in the hands of the Competition Committee at least two weeks prior to the scheduled date for technical inspection.

Waiver Request Format:

Section 1: Specific rule for which waiver is requested: Cite the exact page and reference number for the rule.

Section 2: Specific deviation requested: Go into detail describing the exact deviation you request. Specific rewording of the rule is required.

Section 3: Justification: Go into detail describing why the Committee should approve this request and describe the consequences of disapproval.

Section 4: Approvals: The waiver request must be approved by the Team Captain and the Chief Faculty Advisor. Both persons must sign the document.

Section 5: Supporting documentation: Teams may attach drawings or other documentation to support their request. Drawings should be held to reasonable size, and supporting documentation should be kept to the minimum necessary.

Waiver requests may be sent by regular mail only with original signatures on the document. Requests sent by email will be considered, but they will not be approved until the paper document is received. Approval will be made via email or phone, but will not be official until the team receives the signed paper copy. In the absence of any formal response, the team will assume the request is disapproved. However, formal disapproval will be sent by regular mail as soon as possible.

Waiver requests will not be returned to the teams and will be retained by IMSTEA.

Section VI, Rules for Technical Inspection

All entries must pass technical inspection before they will be allowed on the track. Technical inspection will be held at a time and place to be announced by the Competition Committee. Technical inspection will consist of tests to determine compliance with the rules governing all safety and performance aspects of each vehicle.

One copy of the completed Technical Inspection Checklist will be retained by the Competition Committee, and one copy will be given to the Team Captain. The Team Captain's copy of the Checklist must be readily available to IMSTEA officials throughout the competition. It must be presented to any IMSTEA official upon request.

At the time of Technical Inspection, the vehicle will be compared to the design proposal submitted by the school. Changes made to the vehicle since the design proposal must be documented in writing and presented to IMSTEA officials at that time.

Any failure of Technical Inspection must be corrected before the vehicle will be allowed on the track. Each item requiring attention must be presented for re-inspection by an IMSTEA official who will make an appropriate entry on the Technical Inspection Checklist indicating that the problem has been corrected. If a problem cannot be corrected on the day of technical inspection, the vehicle may be presented for inspection on the day of the event.

VII Rules for Competition

A. Distance: Each vehicle will be required to complete a specific distance of ten laps (6.25 miles). All vehicles will be required to maintain a minimum average speed of 15 mph (24 Km/hr; maximum time for a run will be 25 minutes) for the run. Runs which do not meet the minimum speed requirement will not be counted.

B. Fuel Tanks: Each team will turn in its primary fuel tank for each vehicle immediately following the drivers meeting on the day of the event. Tanks will be held at the fueling area until the track closes for official runs.

C**. Fueling:** Before making an official run the vehicle will be moved to the pre-grid area for inspection and fueling. **NO MORE THAN TWO CREW MEMBERS MAY ACCOMPANY THE DRIVER AND THE VEHICLE INTO THE FUELING AREA, AND ALL CREWMEMBERS MUST BE WEARING SAFETY GLASSES.** After technical inspection one team member will proceed to the fueling area to obtain the team's tank for that vehicle and have it weighed. **No fuel may be removed from the tank before or after weigh in.** The fuel tank will be installed under the supervision of an official. The fuel feed line may be filled with fuel at this time while the official is present. **NO FURTHER REMOVAL, MODIFICATION OR ADDITION OF ANY SUBSTANCE TO THE FUEL TANK WILL BE PERMITTED.**

D**. Start:**

1. The event will be run in heats. After fueling, the vehicle will be moved top the starting grid to await the next heat. **NO MORE THAN TWO CREW MEMBERS MAY ACCOMPANY THE VEHICLE TO THE GRID.** To begin the heat, the starter will signal the first four vehicles on the grid to start engines. When the vehicle is ready to leave the grid, a crewmember will signal the starter by raising his arm in the air. The starter will, then, signal the vehicle to take the track. This procedure will continue until all vehicles have left the grid. Vehicles unable to enter the track must be pushed back to the grid area for restart. **VEHICLES MAY NOT BE PUSHED STARTED AND MUST LEAVE THE GRID UNDER THEIR OWN POWER**. Since time for each heat begins when the first vehicle crosses the starting line, the heat will be run for 25 minutes after the last vehicle leaves the grid. Should an individual vehicle's heat time exceed the 25 minute maximum, that vehicle's individual lap times will be added to determine its official run time.

2. **NO MORE THAN TWO CREW MEMBERS MAY BE PRESENT AT THE WALL NEXT TO THE TRACK AT ANY TIME.** During a run, vehicles may coast with the engine turned off, but the driver must be able to restart the engine without stopping or exiting the vehicle.

3. During a run, a driver may perform only minor repairs on the vehicle (e.g. reinstalling the drive chain). Stalled vehicles will be removed from the track and returned to the pit area.

E**. Finish:**

1. The driver may coast the vehicle past the finish line. However, the vehicle must exit the track under its own power. **CREW MEMBERS MAY NOT CROSS OVER THE WALL TO ASSIST THE VEHICLE OFF THE TRACK.** Once the vehicle has exited the track, crew members may push it back to the pit area or back into the fueling area. No repairs may be made in the fueling area. All repairs and adjustments must be made in the pit area.

2. Upon successful completion of the performance run the fuel tank will be removed by one team member under the supervision of an official and weighed by the judges.

a. The fuel tank may not be removed from the vehicle until the vehicle is in the fueling area and under the supervision of a fueling official.

b. The removal of the fuel tank must be accomplished in the following manner:

(1) The fuel shut off valve at the tank will be closed.
(2) The fuel line will be disconnected from the tank.
(3) The tank will be taken directly to the scales to be weighed.

3. Empty fuel tanks will not be weighed. An empty fuel tank voids the run. Fuel must also fill the fuel line before the fuel valve is closed and the tank is removed. **ANY EMPTY SECTION OF THE FUEL LINE WILL VOID THE RUN.**

4. The fuel tank will be left at the fueling area to be re-filled for the next run.

F**. Scoring:** The three (3) best runs will be averaged for the challenge. A vehicle must complete a minimum of three (3) official runs to qualify for the trophy, but may make as many runs as they desire. All vehicles completing at least one (1) run will be awarded a certificate of completion showing their actual mileage achieved. Any attempt to falsify or misrepresent the actual mileage of any run will be cause for disqualification. Any run where the actual fuel used cannot be verified will be voided.

G**. Awards:** Every attempt will be made to validate results on the day of the competition. However, the results will not be considered final until all records have been reviewed in detail and all allegations of rule violations are resolved. Official results will be emailed to all contestants within two days after of the event or after all conflicts are resolved.

H**. Driving Notes:** (Any changes will be noted at drivers meeting)

1. Vehicles coasting are required to stay to the left hand side of the track.

2. Vehicles accelerating are required to keep to right side of the track.

3. Always look for other vehicles while driving, especially during accelerating!

4. Vehicles seen to be operating in a dangerous manner will be flagged off the track and may be barred from making further runs.

I. General Notes:

1. Teachers/Advisors/Parents will only be allowed in the pits to check on student progress and offer advice or guidance. Teachers/Advisors will not be allowed to work on vehicles directly. Any violation of this rule will be cause for immediate disqualification.

2. Teachers/Advisors/Parents will be assigned jobs during competition activities, such as timers, spotters, or runners.

3. A team may consist of no more than 15 students (including drivers) per vehicle.

4. Vehicles will be allowed to coast during mileage runs. Coasting vehicles must have a system for the driver to restart the engine unassisted (recoil starters only in stock class).

5. Assigned judges will monitor vehicle speed during competition. Any vehicle that is driving excessively fast or recklessly will receive a warning and that driver will be suspended from any more driving (including testing in pit areas). A second violation will suspend a vehicle from any further competition; however, all prior completed mileage runs will stand.

VIII Protests and Inquiries

A. Informal Inquiries: Any team captain or faculty advisor may present an informal inquiry request to IMSTEA officials. IMSTEA reserves the right to take whatever action it sees fit on such requests.

B. Formal Protests: All formal protests must be submitted in writing to the senior IMSTEA official. Protests must be signed by the team captain and approved by the lead faculty advisor. Protests must define the alleged rule violation and include as much supporting information as possible. Formal protests will be investigated as appropriate by IMSTEA officials and a decision will be made as soon as possible. The decision of IMSTEA is final in all cases, and no appeal is allowed. Protests must be submitted no later than twenty (20) minutes following the close of the track for official runs. No protest will be considered after the official results are published.

In all cases of dispute, the Competition Committee will consider the intent of these rules as well as the actual wording of the rules in making their decision. **In all cases, the decision of the Competition Committee is final.**